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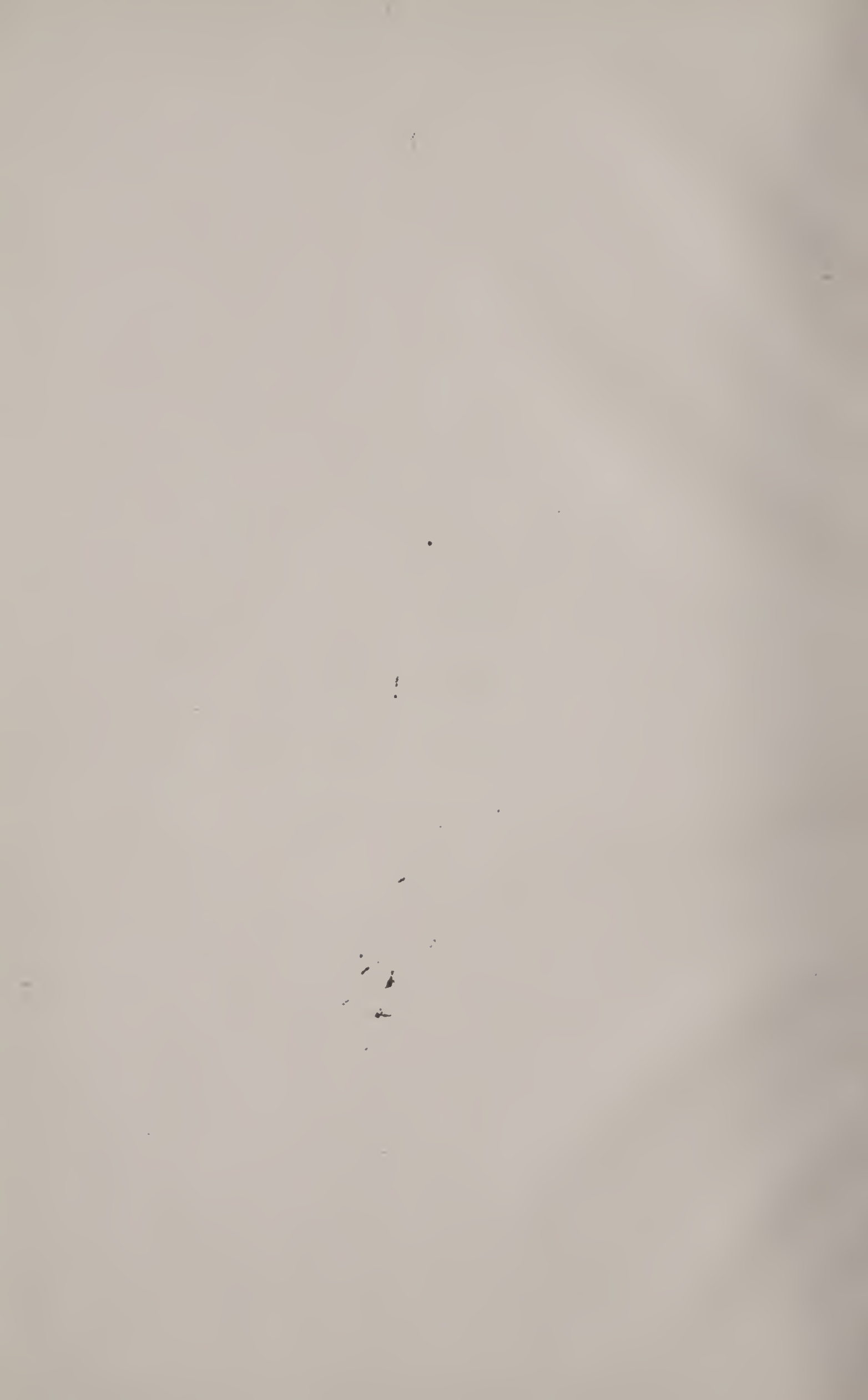
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IRON TON, O.

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AND THE  
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OF OHIO.

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*Manufacturers of Superior*

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SUITABLE FOR CAR WHEELS, CHILL ROLLS, PLOWS,  
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P. O. IRONTON, O.

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No. 3 chills  $\frac{3}{4}$  inch in bar, 1x1.

Mottled.

White.

#### GRADES.

No. 0—0 chill.

" 1— $\frac{1}{4}$  inch "

" 2— $\frac{1}{2}$  " "

" 3— $\frac{3}{4}$  " "

" 4—Mottled.

" 5—White.

Monitor Furnace Co.

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# THE HANGING ROCK IRON REGION.

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This is generally understood as embracing a large portion of south eastern Ohio and north-eastern Kentucky, in fact, all of the ore-producing territory in those limits. In that light, it covers a belt of about twelve miles in width, and perhaps fifty miles in length north of the Ohio river, and thirty below it; though this belt of ore runs northward into northern Ohio, and south into Tennessee, where it is known as the Chattanooga Iron District, changing its name with the locality. The name originated as follows: In the decade of 1830 and 1840, the excellent qualities of iron shipped from the village of Hanging Rock in Lawrence County, Ohio, and made at the furnaces in that vicinity, attracted the attention of iron manufacturers in Pittsburg and other markets, and it became known very favorably as "Hanging Rock Iron," from the name of its shipping port. Gradually, the name was extended to cover the product of the entire region first mentioned; but, in the following pages, it is proposed to treat only of that region to which the name was first applied, and embracing a scope of country within a radius of about twenty miles from the original center of Hanging Rock, or, now more properly speaking, the city of Ironton, immediately adjacent to the first named, but the business center of all treated of. Within this scope are collected twenty-five blast furnaces, producing all the known grades of iron, some of which have no known superior elsewhere; large rolling and nail mills, foundries and machine shops, the aggregate of whose products amounts to a value of millions yearly, as will be spoken of more in detail farther on. In it is the city of Ironton, and the towns of Hanging Rock, Ashland and Greenupburg, which, with the surrounding country, contain a population of about 40,000, which is nearly all dependent upon, and supported by, the iron industry. Here are collected closely together a vast amount of the best ores, immense deposits of the finest coals, beds of the finest fire and other clays, molding sand, and exhaustless quantities of limestones and sandstones, in a region, the greater part naturally thin and inclined to sterility, but with huge hills covered with extensive forests of fine timber, and cut up by numerous well watered ravines, affording splendid opportunities for access to the minerals in them—the whole forming such a combination of mineral wealth and natural advantages for the production of iron in its best forms, as it is believed is found nowhere else in the same limits in the United States.

The region now spoken of is pretty equally divided by the Ohio river, though the characteristics are very much the same in both sections, the chief difference being, that in Ohio there has been a greater development of resources very similar to those in Kentucky.

## ORES.

The western line of the iron belt proper, begins some six miles below Ironton, near Union Landing—though furnaces were once built below and west of that line—the eastern limit is above and near Petersburg, opposite Ashland, about four miles above Ironton. Preserving the same relative distances nearly between its outside limits, this belt runs northerly with a slight inclination to the east. The dip of its strata is to the east with a slight deviation to the south, and these directions are pretty generally uniform through this entire region. Throughout the whole of it are found two strata of ore; the first, appearing in the summit of the hills along the western limit, and known as the “block” variety, a homogeneous ore, which takes its name from the block form in which it quarries. This yields from 25 to 40 per cent. of iron, and runs in a ledge of from 4 inches, in exceptional cases, to as high as thirty inches in thickness. Lying above this at a distance of from thirty to seventy-five feet, and immediately over a stratum of limestone, is what is termed the limestone ore; this yields from 30 to 60 per cent. of iron, and ranges in thickness from eight inches to as high as three, five, and in one instance as high as seven feet. But probably, the nearest average would be ten inches for the block, and twelve for the limestone ore. These are the two general species of ores in this section. There are different varieties of these in different localities, which impart peculiar qualities to the iron; but there are only the two before-mentioned distinct species. Frequently, as at Lawrence furnace, there are found immediately above the limestone ore, irregularly appearing masses of ore, known as “kidneys” from their shape, which are from the weight of half a ton down to a piece weighing a pound only. And again, in the tops of the hills are found layers of “kidneys”, known as “top hill ore,” which makes an excellent iron, and both of which are classed as limestone ores. In different localities these strata are subdivided, and appear in more subdivisions, but still the characteristics are very much the same. The dip is from 25 to 30 feet to the mile. The hills being from 200 to 300 feet in height, it follows that each of these strata will disappear below the surface at a distance of from eight to ten miles east from its first appearance on the summit of the hills.

With some exceptions at Hecla Furnace, not a ton of ore has yet been mined in this section, by shafting as is frequently done in England, although, when once these rich ore beds in the hills become difficult of access, there will, undoubtedly, be opened up by that method an exceedingly rich region beyond the eastern line of this belt, where these different strata will be found in exhaustless quantities below the entire surface of the country, though that contingency is too many thousands of years away to materially interest the present generation.

## COAL.

The coal found here lies in several seams, of which there are but three or four workable with the present supply and demand. At the works of Means, Kyle, & Co., of Hanging Rock, is worked a seam of from three to four feet in thickness. Back of Ironton, in the river hills, are worked the same veins for city domestic consumption; and back of the city some seven miles on the Iron R. R. is procured the coal required for the use of the several rolling mills of the city. At Sheridan, seven miles above is worked another, but similar vein, which is furnished principally to steamboats, and for domestic consumption. Throughout all this region are to be found these veins of coal, lying in accessible positions, but awaiting development; for, except at the points named, there has been but sufficient “pecking at” the outside edges of these coal deposits to supply neighborhood wants. All these are excellent coals, suitable for rolling mill purposes, but unsuited to the smelting of iron, from the presence of sulphur. There is found at Jackson C. H. some fifty or more miles north, a vein of coal which is well suited for that purpose, and is so used in the furnaces at that point.



At Coalton, back of Ashland, in Kentucky, lie immense deposits of coal, which are remarkably free from sulphur, and it is used in the furnaces at Ashland and Ironton very successfully. At the site of Oak Ridge furnace, 10 miles east of Lawrence furnace and two miles from Symmes, Creek, in Lawrence county, is a vein of coal seven feet in thickness, which is reported to be very pure. Whether this is identical with the Coalton vein is not yet known, though it probably is not. As yet, it lies awaiting development, being quite inaccessible at present.

## OTHER MINERALS.

Within this belt are found vast deposits of fire and potter's clay, molding sand, burr, lime and sand stones, suitable for building and other purposes. Great quantities of fire brick are made at Petersburg, opposite Ashland, at Bellefonte, furnace, nearly opposite, by Means & Russell, and several other points in this region, and used in the several manufactories of this locality, and for exportation. Molding sand of the best quality, adapted to making the finest castings, is found near the river in quantities inexhaustible, and costing, practically, nothing. Every furnace possesses quantities of sand stone, adapted for its own stacks and hearths, and, from the lands of Franklin jr., furnace, this rock is exported to Tennessee, for eupolas and furnace hearths. Five miles above Ironton is found a ledge of rock believed to be well adapted, to the manufacture of flint glass, but which has never been experimented for that purpose. A fine deposit of this is said to exist in Carter County, Ky., on the line of the Eastern Kentucky R. R., not more than thirty miles from Ironton. Salt was supplied to the whole of interior Kentucky, forty years ago, from the salt wells on Little Sandy river, near Grayson, some twenty-five miles from Ironton. The opening of richer veins caused that to diminish its business, though along that stream are many places where the manufacture of salt could be made very profitable. At Star furnace, at the terminus of the L. & B. S. R. R., eighteen miles from Ashland, Ky., the Messrs. Lampton Bros., in boring for a supply of water for their furnace, in 1870, struck salt veins at the respective depths of 200 and 420 feet, which proved quite strong, but nothing was done towards developing it, though there is no doubt, the working of it would prove very profitable. No attempt has ever been made toward erecting salt manufactories in this region, but, with the vast quantities of coal in the hills, when the country is properly opened up by railroads, it would certainly become a valuable industry.

The supply of

## CHARCOAL

is one of the most important adjuncts of iron-making, since in general the ores will go to the fuel, instead of the reverse. Here, the entire surface of the country was, in the beginning of the iron manufacture, covered with dense forests of oak, beech, ash, hickory, maple, yellow pine, poplar, and walnut timber, the ravines afforded an abundance of water for the manufacture of charcoal from the timber on their sides, and charcoal was the cheapest, as it is by far the best fuel for smelting purposes.

So that in this part of the West there were

## ALL THE MATERIALS FOR IRON MAKING

on the spot, indeed seldom are they collected so compactly as they are here found. The hills were rich store-houses where were laid up vast quantities of the richest and best qualities of ores, of different varieties, all exposed advantageously to the miner by the numerous ravines that cut the face of the country in every direction; interspersed with the ore strata were deposits of coal, fire clay

and sand stone. Here the furnaceman could build his furnace hearth and stack from stone on his own land, make his own fire-brick, cut and char his own wood, dig his own ore, and quarry his own limestone; and, with the addition of a little machinery imported from Pittsburg or Cincinnati, set his "blast" in operation, and tap the molten metal into the pig beds, where it cooled preparatory to being hauled to the nearest landing on the Ohio, for shipment to market. Except that the natural thinness of the soil, the newness of the region, and the fact that he himself held vast quantities of land away from the farmer, obliged him to draw largely on more favored agricultural regions for supplies of provisions for his men and teams, he found every thing he required, for the successful and profitable prosecution of his business on the spot. Consequently, it is no wonder that we have to record the following

## HISTORY OF IRON MAKING

in the Hanging Rock District.

The first furnace in Ohio was built in 1811, on Brush Creek, in Adams County, some seventeen miles from the Ohio river. As might be expected, it was of the rudest construction. The stones for its hearth were brought from near Beaver, Pa. The machinery for blowing the blast was driven by water; the yield was about one ton daily of cold-blast charcoal iron. The first furnace with blast driven by steam in the United States, was built in 1819, in Adams County, Ohio. Here the ore lay in "nests" of the "kidney" varieties, and not in regular strata, and the deposits were long since exhausted, and the furnaces abandoned.

The discovery of ores in the Hanging Rock region, naturally drew the attention of the Adams County furnace-men, and they were the first to erect furnaces here. Messrs Sparks, Means & Fair, built the first in 1826. It was called Union Furnace, and was built between the present location of Ohio and Pine Grove furnaces, some four miles from the Ohio river, and about the same distance from the site of the after village of Hanging Rock. This went into blast in the year 1827, and the first fire in it was lit by Mr. T. W. Means, the senior member of the wealthy firm of Means, Kyle & Co., of Hanging Rock. This produced but a ton daily, of cold blast charcoal iron, but the experience of the managers raised the production to two and a half tons daily, which was considered as doing very well. (When a few years later, the managers of Lawrence furnace aimed to produce a thousand tons yearly, it was regarded as something unparalleled!) As the country became better known, other furnaces, La Grange, Vesuvius, Hecla, Lawrence, Mt. Vernon, Franklin, and others, were built and operated, and the character of their iron became known in the markets as among the best. At those days, (nearly forty years since,) the blast was always blown of cold air, and sometimes introduced through hollow gum logs placed back from the tuyere opening out of danger of fire from the interior. Wages were exceedingly low, wood was cut for 25 cents per cord, corn cost  $12\frac{1}{2}$  cents per bushel, hay only brought \$4.00 and \$5.00 per ton, and whisky was the almost necessary adjunct to every bargain and contract. The old books kept at the early furnaces often showing entries such as "John Smith contracts to make one hundred rods of road for \$25.00, and two gallons whisky." At that period it was the object of the furnace men to manufacture into castings as much as possible the products of the furnace, and salt kettles, kitchen utensils, and other castings and moldings were made during the week, and pig iron run on Sunday. The first stoves for burning coal made in this section were cast at Pine Grove furnace. Forges were erected in different places, which were run by water power, and hammered, instead of rolling the iron into merchant bar. A nail factory was set up at Maysville about 1820, and the nails were bought at \$20.00 per keg. Now such nails as it made could be sold for scrap iron only.

As before stated, the first iron produced was by cold blast, and there is no iron otherwise made, which is so pure, has so great tenacity, or so great durability of wearing surface. Of later years the introduction of the hot blast increased the yield, but the quality of the iron was in some respects changed.



There are now within a radius of twenty miles from Ironton, the following furnaces with their yearly production in round numbers as nearly as may be:

			Fuel.	Yearly Production.	Shipping from
Monitor .....	Cold	blast.....	Charcoal.....	2,500 tons. ....	Petersburg.
Ohio .....	Hot	" .....	" .....	3,000 " .....	Hanging Rock.
Pine Grove.....	"	" .....	" .....	3,000 " .....	" "
Hecla.....	Cold	" .....	" .....	2,500 " .....	Ironton.
Lawrence.....	"	" .....	" .....	2,500 " .....	"
Vesuvius.....	Warm	" .....	" .....	2,500 " .....	"
Center .....	Hot	" .....	" .....	3,000 " .....	"
Grant....	"	" .....	" .....	2,500 " .....	"
Olive.....	"	" .....	" .....	3,000 " .....	"
Buckhorn.....	"	" .....	" .....	3,000 " .....	"
Howard.....	"	" .....	" .....	3,000 " .....	"
Mt. Vernon.....	"	" .....	" .....	3,500 " .....	"
Etna.....	"	" .....	" .....	3,000 " .....	"
Belfont.....	"	" .....	Stone coal.....	7,500 " .....	"

## IN KENTUCKY.

			Fuel.	Yearly Production.	Shipping from
Ashland .....	Hot	blast.....	Stone coal.....	12,000 tons.....	Ashland.
Star.....	"	" .....	" .....	3,500 " .....	"
Mt. Savage.....	"	" .....	Charcoal.....	3,000 " .....	"
Buena Vista.....	"	" .....	" .....	3,500 " .....	"
Bellefonte.....	"	" .....	" .....	3,000 " .....	Landing.
Buffalo.....	"	" .....	" .....	2,000 " .....	"
Hunnewell.....	"	" .....	" .....	2,500 " .....	"
Pennsylvania .....	"	" .....	" .....	2,500 " .....	"
Laurel.....	"	" .....	" .....	2,000 " .....	"
Raccoon .....	Cold	" .....	" .....	2,000 " .....	"
Boone.....	Hot	" .....	" .....	2,000 " .....	"

Showing an aggregate production yearly of 82,500 tons of iron, which, at the market rate of \$33 per ton, amounts to \$2,722 500. Of this 36,000 tons, worth \$1,188 000, pass through Ironton, and are shipped from her wharf

## THE QUALITY OF IRON

produced has long been noted for its excellent qualities, and is much sought after for special purposes. From twelve experiments made with hammered bars the tension of the best Juniata iron was found to be from 70,000 to 75,000 lbs. to the square inch. Salisbury iron from 75,000 to 78,000, and of Hanging Rock iron from 87,000 to 91,000 lbs. per square inch. Car wheels made from Hanging Rock cold-blast iron sell readily at \$25.00 each, when those made from the best Pennsylvania iron will command \$19. only. Manufacturers in Cincinnati, Louisville, St. Louis, Columbus, Pittsburg, Buffalo and Troy, seek eagerly for, and pay high prices to obtain this, as the best article the market affords. Its closeness of texture, firmness, strength and length of fibre, fit it especially for the making of heavy machinery where it will have to undergo the severest strains, and render it capable of being worked into the finest and best of steel.

Those kinds of iron made here, adapted for foundry purposes are remarkably fluid when melted, and are thus fitted to take the finest impressions and make the most beautiful castings. They are largely used in the foundries of Ironton, Cincinnati, Louisville, Pittsburg and Wheeling.

## THE SUPPLY OF ORE

has as yet been scarcely touched upon by the furnaces hitherto established. Beds of ore are frequently discovered on lands which were thought to have been exhausted. If we estimate that one fourth of the surface is underlaid with ore to the thickness of ten inches, which is certainly moderate, we then have in the belt of ten miles in width, and twenty miles, both north and south, from Ironton, an area of one hundred square miles or 64,000 acres, of ore-bearing territory. At the computation of 2,800 tons of ore per acre, as given by furnace men for that thickness, this would yield a supply sufficient for the existing furnaces of the region at their present rate of consumption for the next *eight hundred and fifty years!* Professor Briggs in his Geological Report of Ohio, in 1838, page 93, says: "The iron region, from the Ohio river, near Franklin furnace, northward by Jackson, to the Hocking river, occupies an area equal to an unbroken stratum fifty miles long, and six miles wide, capable of yielding 3,000,000 tons of good iron ore to *each square mile*, and that the quantity of ore is so great that Jackson, Lawrence, and Scioto counties are capable of producing 400 000 tons of iron annually for 2,700 years." A statement much in advance of that just made, but by one who had competent data to judge from.

To aid in smelting this vast amount of ore, limestone of the best quality is always to be had, as cheaply obtained as any where in the world. Charcoal has been, and is now, the principal fuel used. But the vast forests supplying it have melted gradually away before the ax of the furnace men, and already the supply is becoming a matter of serious thought in localities. Each furnace will consume on an average from 12,000 to 15,000 cords of wood yearly. This immense consumption is slowly replaced by the "second growth" of timber, at the rate of about two cords per acre yearly. In the case of furnaces owning large tracts of land there will be some which can continue their operations with charcoal fuel indefinitely. But with many, in the course of the next fifteen years, they must be seriously cramped, unless they should draw their supplies from the extensive forests in Eastern Kentucky, and West Virginia, which of course would largely increase the cost of production. But cold-blast charcoal iron from this region will probably never be excelled in quality, and will find a sufficient demand for all that can be supplied, even at a large advance from its present cost. In this light the



## MANUFACTURE OF IRON IN THE FUTURE,

it is plain, must largely depend upon some other fuel. And now is seen the value of the Coalton vein of coal as evidenced by the experiments of the Ashland and Belfont furnaces. In the country adjacent to Coalton this deposit is found in vast quantities sufficient for the wants of this region for hundreds of years to come. This can be delivered at any point along the river at a price which will enable it to be used at a profit in the smelting furnace, and in any desired quantity. At Jackson, Ohio, is another deposit equally as good for smelting purposes. To bring this to the river at Ironton profitably, would require an extension of the present, or the building of another line of R. R. northward. The connection of such a line with Columbus, would open up a vast amount of business in this section of country. Besides enabling the coal above spoken of to be brought here, it would afford a passage for an immense quantity of lake ores from the North to be brought here to mix with our native ores, as is now done with Missouri ore, the supply of which is precarious, from the heavy drafts made upon it and the fact that it must now be delivered by a river, which in certain seasons can not be depended upon. Whether the seven foot seam of coal found at Oak Ridge as heretofore stated, is sufficiently pure for purposes of smelting, is yet to be ascertained. Should such be the case it would afford a supply sufficient for the most extravagant estimate. But the desideratum needed is a method of using the native coal in the blast furnace, as attempted by Mr. Peters a short time since, elsewhere referred to. This found, and furnaces will become as plentiful as the facilities for transporting their supplies and products, to and from their sites, will allow. It is a remarkable fact that "furnace men know less of their business, really, than any other class of manufacturers in the United States." By which is meant that the chemical laws governing the production of iron, and the chemical solution of its various problems are unknown, in general, to the very men who would most be profited thereby. Inquiry substantiates the assertion. During the past generation they have increased the production of their furnaces, but not improved materially the process. Still, science, unaided by experience, seems not so well adapted to the proper working of an iron furnace, as experience alone. A notable instance occurred in the erection of Oak Ridge furnace, some years since, by a wealthy company, guided by the theoretic knowledge of a gentleman of the highest scientific attainments, who pronounced the site to be among ores of extraordinary richness. The furnace made but one "blast," and the money spent in its erection has long since been regarded as one of the most permanent investments. Still, when science and practice go hand in hand, with an intimate acquaintance, we may look for the proper advance to be made. Already practical minds with a proper knowledge of chemistry are seeking the solution of these problems, and we may not be surprised at any day to hear of the discovery that our ores may be smelted by our native coals. The discovery of Mr. Charles Burgess in the manufacture of steel, seems to indicate that the thing is practicable.

## THE CITY OF IRONTON

is situated on the north bank of the Ohio river, 145 miles above Cincinnati, ten below the junction of the Big Sandy river with that stream, in  $38\frac{1}{2}^{\circ}$  north latitude, and  $5\frac{1}{2}^{\circ}$  west from Washington. The town was laid out in 1849, and was selected as the terminus of the Iron R. R. which was built for the transportation of iron and supplies to and from the furnaces lying back from the river. In 1851 it became the county seat of Lawrence county. In 1865 it was incorporated as a city of the second class. The population in 1860 was 3,700. In 1870 it was 5,688, according to the Federal census. On the 1st of January, 1871, according to an enumeration taken by authority and direction of the City



Council, it was 6,383. The city is very pleasantly located on a wide stretch of "first" and "second bottom," running back from the river half a mile to the hills that rise in the rear, four hundred feet above the level of the town. It is quite regularly laid out, with broad streets. During the war the growth of the place was very much checked. It was near the border of guerilla warfare, the iron industry was depressed, property was sold for a mere song, and the place stood still in growth. With the return of peace the price of property rose, and the natural advantages of its situation have caused a rapid and healthy growth. Now, there are but few places in this section of the United States so rapidly increasing in population, in wealth or importance. The smoke from her furnaces, mills and manufactories is continually rising, and the busy whirl of the wheels and clatter of the workmen's tools are constantly heard on all sides. Property is constantly rising in value, and improvements are continually going on. The amount of property on the tax duplicate is now \$2,850,000. During the year 1870 the city expended on streets over \$55,000. There are now being erected Water Works on the Holly system, at a cost of \$130,000. A gas company with \$40,000 capital supplies gas to all points of the city. Carpenters and bricklayers find an increasing demand for their services in the erection of a great number of new houses yearly.

In the city, besides the usual amount of business incident to towns having this amount of population, are the establishments of which mention is made further on and in detail, which manufacture iron to the aggregate yearly value of \$2,750,000. There are also transported to her wharf yearly the amount of 36,000 tons of pig iron for use in her mills and for shipment abroad, the value of which is \$1,188,000.

The supplies for nine furnaces pass directly through her streets and from her wharf, amounting in the aggregate to \$360,000 yearly, besides the vast quantity supplied to the surrounding region.

She is the center of, and the distributing depot for the best and largest part of the Hanging Rock iron district. At her wharf the large steamers plying on the Ohio between Marietta and Cincinnati, lie the longest, and take on board more freight, than at any other port.

In low water she is the largest town near the head of navigation from Cincinnati upward. During the lowest water of the present summer, it was very frequently the case, that boats from Cincinnati went up no further than here. The town contains two large planing and saw mills, procuring lumber from West Virginia, Eastern Kentucky, and the Alleghany river. In connection with one is a boat yard where steamboat and barge building are carried on. When the building of iron hulls for steamboats is fairly inaugurated, Ironton will possess the finest facilities for that speciality on the river, the quantity and cheapness of her iron and steel plates, the abundance of excellent timber and the depth of her harbor—always deep enough for the largest boats—offering the most superior inducements.

There are also two large rolling mills, the largest nail mill in the West, a large machine shop, one of the largest and best foundries in the Mississippi Valley, extensive hoe works, two blast furnaces, boiler yards, R. R. machine shops, and a large keg factory, besides the regular amount of the minor manufactories that are common to a city and will be found mentioned in the Business Directory of the place, while those first mentioned, which are engaged in the manufacture of the great staple of the region—Iron—are mentioned more in detail further on.

Ironton is situated in the most isolated section of the State with regard to railroads. The broad Ohio, to be sure, affords an easy and cheap transit for her heavy freightage. But re-shipments are necessary in most cases, and besides, the beautiful river imposes a heavy transit for its advantages, when in winter there are weeks when the ice closes navigation, and in summer low water causes immeasurable damage to business.

The building of the eleven miles intervening between the terminus of the Iron R. R. and the Portsmouth branch of the M. & C. R. R. would add very many

advantages to the place, but the best route would be one to Columbus direct. This would open up, not only the great agricultural resources of the interior of the State, but also allow of the importation of ore from the northern lakes, which is as valuable for admixture with our native limestone ores as that from Iron Mountain, Missouri. Furnaces would spring up at once along the banks of the Ohio at Ironton, using Ashland or Jackson coal, and native ores, and limestones, together with that from the lakes, cheaper than at any other point probably in the Mississippi Valley.

Rolling mills would follow suit, for they could then have the advantage of both rail and water shipments. No better place can be found for machine shops of the largest and best description, for here is the best iron known for the manufacture of machinery. A boat yard for the building of iron hulls would naturally come where could be had, the advantages enumerated above. No better point for glass works need be desired, and it is a matter of surprise that some have not been heretofore erected. Wholesaling can be established here to an immense advantage. There are now five wholesale grocery establishments doing a business of more than \$500,000 annually. Considerable wholesaling is also done in clothing, and to some extent in dry goods.

Great advantages would accrue to the city were there wholesale houses here in the lines of dry goods, boots and shoes, glass and china ware, and general notions. Then merchants from the vicinity would find here the full complement of their wants, and buy their entire stock in a short time and in one trip. As it now is, country merchants coming here to replenish their shelves, find that to finish their stock, they must proceed to Portsmouth, or Cincinnati, to get their boots and shoes, and generally their dry goods also.

Portsmouth with less material advantages than Ironton, furnishes all these, and drives a flourishing trade in these several branches, with a large scope of territory that Ironton should supply.

Twenty-two of the furnaces enumerated as in the region under consideration, have their own store and supply their workmen and others with provisions, &c. Probably \$35,000 yearly is a small average for their sales, which would amount to \$770,000 in the aggregate. Each will consume about 15,000 bushels of corn yearly for their teams and for sale. This amounts to 330,000 bushels, which, at 65 cents per bushel, foots up the yearly aggregate of \$214,500. Of these supplies the greater part come from Cincinnati—but were opportunity afforded, Ironton would sell the greater part. The corn comes principally from the rich Scioto valley, by canal to Portsmouth, and by river from there up. A railroad into the interior would bring the whole of this to Ironton. This is the largest city west of the mountain lying in the line of the Ch. & O. R. R. which strikes the Ohio river at Guyandotte some twenty miles above, with an uncertainty for the route of its further continuance. To continue this R. R. on the north bank of the river to Cincinnati would afford transit for goods from there here, and for our manufactured wares to that place, (our principal market,) on one of the easiest of grades, and strike the flourishing towns of Ironton and Portsmouth in the iron belt with their fine future and rapidly extending business. The construction of such a line to Columbus as indicated, joining at Ironton a river connection of the Chesapeake and Ohio R. R. from Guyandotte to Cincinnati would afford the city of Ironton an outlet east, west and north for her wares, which would pour over them to all parts of the country, and give them immense profits on the carriage, while furnishing full return freights in the various articles needed to supply a large manufacturing section situated in a non-agricultural region. Now, there seems strong probabilities that the Kentucky and Great Eastern R. R. may be completed on the southern or Kentucky shore and through the Kentucky portion of the Hanging Rock region, and within easy reach of Ironton, though the benefit derived therefrom would but indirectly accrue to that place.

We now turn our attention to some of the principal manufactories of Ironton, with a few of the leading furnace of the vicinity, which have been described somewhat in detail. Besides those here enumerated there is the "Grant" furnace



of Messrs. Wm. D. Kelly & Sons, a charcoal hot-blast furnace situated in the upper part of the city on the river bank. Also, the large stove foundry of Mears, Olhaber & Co., producing about 75 stoves daily of almost every conceivable pattern. This was once owned by Messrs. Campbell, Ellison & Co., and Woodrow, Mears & Co., and stoves with one of these brands on are to be found in all parts of the Mississippi Valley.

## THE IRON RAIL ROAD

runs from Ironton northward thirteen miles to Center station, in Lawrence County, and possesses the privilege of extending its line to the Portsmouth branch of the M. & C. R. R. It was incorporated March 7th, 1849. It transports to Ironton the products of Olive, Center, Mt. Vernon, Howard, Buckhorn, Lawrence, Etna, and Vesuvius furnaces, carrying back the supplies for them, and the local trade for the surrounding country. During the year ending April 1st, 1871, it transported 33,495 tons of pig iron, 68,009 tons stone coal, 14,088 tons iron ore and limestone, 1,606 tons mill cinder, and 6,233 tons of merchandise, making an aggregate of 123,431 tons, with 30,540 passengers, realizing an income therefrom of \$98,517.67.

## THE IRONTON ROLLING MILL.--(As Re-organized.)

The works of this Company are situated in the western part of the city, at the junction of Storms creek with the Ohio river. They have a front of 264 feet wharfage, and haul their wares only from the ware-house on the top of the bank, to the landing below, a decided advantage when the immense freightage of such a large establishment is considered. These works were built in 1852, but the present Company was incorporated on the 20th day of January, 1870. At that time the works had been lying idle for about two years. Since then the energetic officers of the Company have thoroughly repaired the buildings and rebuilt the machinery, expending from their profits thereon the sum of \$31,000, until the mill is now in thorough running order, with many and valuable improvements added, and with original faults in construction, wholly remedied, and the works are ready for the heavy business that their energy and quality of work done, have, in so short a time, built up. These works cover about an entire square, and are composed of sixteen puddling, or boiling, and eight heating furnaces, with a complement of five trains of rolls, the muck, sheet, bar, guide and hoop mills, respectively, and the necessary accompanying shears, hammers, ore crushers, blacksmith and pattern shops, and all the paraphernalia for turning out all kinds of merchant and bar iron on a large scale. These are driven by engines of a thousand horse power, and their working requires a consumption of seventy-two tons of coal daily, on "single turn," and one hundred and eight in a "double turn," which is dug on the lands owned by the Company, and delivered in the turn at the mill, from the track of the Iron Railroad, at an average cost of \$1.62½ per ton. In their present capacity, these works are capable of turning out daily thirty-five tons of finished iron in "single turn," and sixty on double turn, of twenty distinct varieties and one thousand different sizes. Their principal sales are made at their warehouse in Cincinnati, by Mr. D. T. Woodrow, their agent, at the corner of Front and Race streets, but also distributed by orders to the mill directly, to all parts of the Mississippi Valley. At present the number of hands upon the pay-rolls of the Company are 150, (besides 75 which are employed and paid by the several employees as "helpers" to the heaters, rollers, and puddlers,) when running in "single turn," which, when increased to the "double turn," as they are obliged to do a great portion of the time to keep up to their increasing trade, requires about sixty more. These are paid, on single turn, an average of \$3.000, per week, on double turn,

\$4,500. As at present, they run about twenty weeks on single, and thirty on double turn, yearly, they pay to their employees the handsome sum of \$180,000 yearly. The success attained by the Company in the past year and a half, since they have taken charge of the mill, have determined them on adding to their works a large blast furnace, for the production of their own pig iron, a course, which, when the immense natural advantages of their situation in this iron belt are taken into consideration, will appear as eminently profitable. Besides combining the two profits of smelting, and manufacturing the pig iron, there are many others which at first sight might not appear, not the least of which would be the immense saving, which now with the most economical management is impossible. To enumerate. Under the present battery of boilers in use are used yearly some 11,000 tons of coal, costing about \$18,000. It is proposed to use the gas from the furnace stack, (which the experience of other furnaces has shown would be amply sufficient for that purpose) to heat the boilers, not only for the use of the furnace as is now the invariable custom, but also for the engines used in driving the machinery for the mill. The idea is not original with this Company, though it has been applied to but two other mills in the United States, one of which is situated in Youngstown, and the other in Steubenville, both in Ohio. Here will be a clear saving of \$10,000 yearly, the gas thus being utilized instead of wasted. Again, in each rolling mill of this capacity, there is a waste from the puddling furnaces of what is called "tap cinder," of an aggregate of at least one hundred tons, per month. This is equal in value to that of native ores selling at \$4.50 per ton, for which is now realized at a smelting furnace, \$1.50. This would be used in their own furnace only a few feet distant, and a clear saving of \$300 per month be made on this alone. Again, the site of the furnace will be directly on the bank of the river, and with only the track of the Iron Railroad, between it and the mill, and when it is taken into consideration that the coal and ore used will be delivered directly from car and boat into the yard, and bins of the furnace, that the iron in the casting house of the furnace will be at no greater distance from the puddling furnaces than under the present arrangement, when it is delivered in the stock yard, and that from the warehouse for finished iron to the shipping wharf is only a few yards, it will be seen that the saving in transportation by hauling in these several items, while perhaps it can not be exactly estimated, must amount to a very considerable sum in the course of a year. Add to this the increased economy of management, when it is all under the eye of the same executive officers, and the saving of the salaries of several employees thereby, and it will be seen that the aggregate of these economies must greatly add to the profits, and that dividends must be very satisfactory to stock-holders. The advantage of manufacturing their own pig iron, and producing whatever qualities are desirable for the different grades of finished iron, at will by the admixture of ores in the stack, instead of the several qualities of pig iron in the puddling furnace, are obviously great.

The dimensions of the proposed furnace stack will be about the same as the one at Ashland, and the one now under process of enlargement by the Belfont Iron Works of Ironton, and capable of producing an average of forty tons daily, making it rank among the very largest in the Mississippi Valley.

But one of the most distinguishing feature of the Ironton Rolling Mill, is the manufacture of steel by a process which seems to have gone a great ways toward solving one of the most difficult problems which the iron-master has had to grapple with, viz: the changing at will of the character of the metal, by the introduction of chemicals when the iron is in a melted state. The process is a secret, and the inventor is Mr. Charles Burgess, a young Englishman, who made the discovery while engaged in the manufacture of steel by the old method of heating the bar iron in connection with charcoal. His method was brought to the notice of the Ironton Rolling Mill Co., during the fall of 1870, and at first his proposition was received most incredulously, as one would naturally expect. But his modest confidence in himself led them to permit him to try an experiment in their works with the result of completely vindicating all that he claimed for it.



At once was illustrated the truth of the proverb, that "there is nothing succeeds like success," and the Company soon made permanent arrangements with Mr. Burgess to continue the manufacture of his steel on a larger scale, and at present make it at the rate of about three tons daily. The process is known to but two persons Mr. Burgess and Mr. John R. Williams, the Vice-President and Superintendent of this Company, and it is sufficient to say that the process of manufacture differs but slightly from the ordinary process of preparing the iron for the rolls. All that it consists in being simply the introduction of certain chemicals into the molten iron, when in the boiling or puddling furnace, just before it is ready to undergo the operation of "balling," preparatory to taking it from the furnace. Immediately there is a change takes place in the entire chemical character of the metal, and it becomes "*steel*." It is then taken from the furnace and hammered into blooms, ready for rolling into any desired form of merchant steel, plates or bars. This is found to be unequalled for plows, wagon tires, boiler plates, boiler flanges and homogenous steel for machine purposes, where perfect welding is required. For bridge building purposes, and for boiler plates, at present, and the building of steel hulls for vessels in the (very near) future, this steel would be simply unexcelled. In the manufacture of all articles of hardware heretofore made from iron faced with steel, this would offer superior advantages, being so much cheaper than ordinary steel, that they could be made of one single piece of it, at a decided profit and advantage.

While this is not claimed to be made for the finer purposes for which foreign cast steel is used, there is no doubt it can be made to answer the same purposes. In the first experiment for that purpose, made a few weeks since at a cutlery establishment in Sheffield, England, from a bar of steel made at these works by Mr. Burgess, several sets of fine table cutlery were made, pronounced by the skilled workmen of the manufactory to be "A No. 1."

Mr. Burgess has certainly great cause of congratulation in thus being able to complete in a moment, what, before the invention of Bessemer's process, the world had for generations taken weeks to accomplish. By a certain modification of the process the quality of iron in the ordinary manufacture is improved greatly, and iron, which went into the puddling furnace "red short," and of a very inferior quality, comes out tough enough to roll into hoops that are a marvel of tenacity and ductility. It is to be hoped that this process may be used to solve the difficulties in the making of iron from our native coals, that have baffled the attempts of all our iron smelters for so long a time. Certainly there is much room to hope for in that respect, in view of the chemical wonders it has already accomplished.

The extensive machine shops of Messrs. Lambert & Gordon, known as the "**OLIVE FOUNDRY AND MACHINE SHOP**," is at present the only establishment of the kind in the place. They were erected in 1853 by Messrs. Jas. M. Merrill & Co., and employ a capital of \$80,000, producing finished work of the yearly value of \$140,000, consisting of all kinds of steam engines and boilers, rolling mill and furnace machinery, including some new and excellent patterns for hot-blasts, which have proved very acceptable in actual service in the furnaces of this region. The firm employs fifty-eight hands, uses yearly 8,000 bushels of coal, from their own lands, and manufactures 900 tons of pig-iron, procured from the neighboring furnaces, into finished machinery yearly, and makes sales of their wares throughout the whole iron belt of this region, and along the Ohio river valley, from Marietta to Cincinnati, including those two points. The managing proprietor, Mr. Fred. Gordon, is one of the most thorough and practical machinists in the entire West, and when foreman of the Niles Works of Cincinnati, constructed the machinery for the famous Mississippi steamer, Natchez. He has lately patented a new upright tubular boiler, which is now being manufactured by this firm, and being introduced as its merits become known. It has many features essentially important in the manufacture of this instrument of death, when improperly managed or constructed, but of life, civilization, and advancement, when care is taken in its manufacture and use. We have observed the boiler, and find the following points of excellence,

which are sure to force it into notice, when it has become known to the public. First, it is as nearly non-explosive as any—we say “as any”—since, when steam is generated and there is no escape, explosion *must* occur. This boiler possesses a strong circulating property; the water while steam is being generated, revolving through it with great rapidity, thus eliminating the steam without any explosive effects. Secondly, the feed water is so introduced, that cold water injected into the boiler will never come in contact with a heated surface, without first becoming perfectly mixed with the other water. This feature is by no means to be overlooked, inasmuch as many of the leaky boilers we have, both on land and water, occur from careless engineers introducing cold water, which in the ordinary form of boiler passes along the bottom, the most heated part, and produces a sudden and undue contraction in that line, as it were, when the top of the same boiler retains its extended condition. This being done several times will “draw” the holes, and leaky rivets will be the result. One other feature is, that the arrangement of circulation is such, that any deposits formed, will lodge only below the fire line, and then can be blown off from time to time, without any trouble or inconvenience. Upright tubular boilers are, and have been looked upon with favor, could but one trouble be overcome, that is, the crown sheet has invariably been left to the action of the heated gases without any protection from water. In this case, the objection falls to the ground, as it never leaves the tubes bare, and even when there is a great range in the water line, there can be no danger from the flues being burned; and lastly, the not least important feature to purchasers, at least, this boiler can be sold as low as any, considering its power; viz: for boilers and fixtures complete, \$3,00 per foot of heating surface.

The “SOUTH WESTERN HOE WORKS” were erected in 1864, by Messrs. Tyler Bros. & Co., employing twenty-five hands, at average wages of \$4,00 per day, running six grindstones, and four polishers, and producing on an average forty dozen of hoes daily, selling for six dollars per dozen. The article produced was an excellent hoe for planter’s use, and had a high reputation and extensive sale throughout the southern States, as well as in the more immediate neighborhood. The Messrs. Tylers were excellent mechanics, but excessive importations of cheap hoes from England depressed their prices to such an extent that they were forced to succumb. The works now await a purchaser; and no doubt will prove an excellent investment for him, should he be so fortunate as to secure the services of the same mechanics, whose skill has given their products such a high reputation heretofore.

## THE LAWRENCE IRON WORKS

are situated in the western part of the city immediately adjoining the Belfont nail mill, and are of first-class appointments throughout. The Company was incorporated in 1867, by Cyrus Ellison, Esq., and others, with a capital of \$225,000. Their works comprise sixteen puddling or boiling furnaces, and seven heating furnaces, with five trains of rolls, making all kinds of hoop, guide and band irons, and “T” rails for mining railways; their speciality being in, hoop and band irons, which they sell throughout the entire Mississippi Valley. They can manufacture, running on single turn, twenty-five tons daily; on double turn, forty tons, using therefor sixteen and twenty-hundred bushels of coal respectively, which is dug on the lands owned by the Company, and delivered by the cars of the Iron R. R. These works employ two hundred and fifty hands, to whom they pay each pay day \$7,000. Their principal sales rooms are in Cincinnati, though they ship immense quantities on orders directly to the mill. Assuming three hundred working days to the year, and we have this mill, when running on single turn, producing 7,500 tons of finished iron, worth an aggregate of \$750,000, and paying their workmen the sum of \$180,000, at the top of their capacity producing 12,000 tons.



## THE BELFONT IRON WORKS

are among the leading manufactories of Iron-ton, and are devoted to the production of nails, combining therewith, the smelting of their own pig iron, a feature which, as it secures the double profits of mill and furnace, enables the Company to manufacture their goods at a profit where they otherwise would fail of one. The Company was organized in 1863, by Messrs. E. M., and G. W. Norton and others, with a capital stock of \$150,000, since increased to \$270,000, in consequence of the addition of a furnace to their works. The shares are \$100 each, and an excellent feature is the owning of \$175,000 worth of it by some thirty of the workmen, thus securing a solid interest on their part, in the prosperity of the Company, and better work and more of it than could otherwise be the case. To begin with their furnace department, which we find situated some half mile from the mill, (but connected by the Iron R. R.,) on the bank of the river, in order that the ores from Mo., and the native ores used in the production of their iron, may be more easily delivered from their respective boats, and ears, upon the stock yards. This furnace was erected in 1868 upon the most approved plans, and in the most workmanlike manner. It is constructed as the Ashland furnace, of a stack formed of boiler iron, lined with fire brick, instead of massive blocks of sand stone, as in the older furnaces throughout the remainder of this iron region. The result proves its excellence, as it went out of blast in the summer of 1871, after a "blast" of nearly three years, duration, producing nearly 25,000 tons of an excellent quality of metal, and when it was stopped, it was not from any need of repairing, whatever, but only, in order that there might be an enlargement of its capacity. When it is recollected, that, generally, a furnace "blows" less than a year, when it must be stopped to allow of a new "hearth" being put in, the advantage of the improved plan is obvious. The former height of the stack was fifty feet, width of "bosh" thirteen feet, using twenty-two tons daily of ore, one-half native, and one-half Missouri ore, together with about thirteen tons of mill cinder, and producing about twenty-five tons of iron daily, using Player's hot blast and Ashland coal. This stack is now taken down to be enlarged to the height of seventy feet, with a bosh of sixteen feet, and an increased production to forty tons daily, in order to furnish the proper supply for the increased capacity of the nail mill. The nail mill has fifty nail machines, which have a producing capacity of 120,000 kegs of nails yearly, embracing one hundred and ten different kinds and sizes, from the largest to the smallest. These are distributed throughout the entire valley of the Mississippi from the markets of Cincinnati, Louisville and St. Louis, where they are mostly shipped. It is gratifying to know, that their high character had created such a demand, that in spite of full running time being made up to the time of the stoppage of the mill in August of this year, they were unable to accumulate a stock at their warehouse. At the present writing, there is an addition being made to their capacity of thirty machines, making eighty in all, and increasing their production to 170,000 kegs yearly, employing three hundred hands, to whom are paid yearly \$250,000 in wages. In the mill are nineteen boiling and three heating furnaces, with their complement of rolls to roll the iron into the proper sheets for the nail machines. The working of these requires the use of 600,000 bushels of coal yearly, which is brought in from the banks of the Company, and delivered by the cars of the Iron R. R. The Company also manufacture their own kegs exclusively. As an instance of their capability, and an illustration of successful management, it is worth mentioning that during the week ending March 10, 1871, these works produced on their fifty nail machines, 3,106 kegs of nails, weighing 100 lbs each, a result, which gives a greater average production to each machine than any run of the same length yet recorded. Every employee felt, and feels, as proud of his share in this triumph, as any of the officers of the Company, and announce their intention, should occasion offer, to far excel the above result.



## SHERIDAN COAL WORKS.

These works are situated on the Ohio river, about seven miles above Iron-ton, and the seam worked is about four feet thick, lying near the base of the hill. The Company own here about 700 acres of territory, well stocked with coal of a superior quality. The works are comparatively new, and employ from 80 to 90, hands who mine yearly about 800,000 bushels, which is used mostly on the river by boats, and in Iron-ton and the neighboring towns, for domestic fuel. The coal has not yet been used in a smelting furnace, but "cokes" equal to any coal in the West, and is equal to any for domestic use. It can be delivered at Cincinnati at 8c. per bushel, and in times of scarcity of coal in Cincinnati, like at the present time of writing, it would be found very advantageous to have such a source of supply, the more so, if a railroad was in successful operation to this point, thus rendering that city independent of the fickle river navigation, and comparatively indifferent to the chances of a "coal boat rise" at Pittsburg.

## LAWRENCE FURNACE,

which is probably as nearly the center of the district under consideration as any other, is one of the oldest, has been the seat of a thorough experiment in smelting with the native coal, and now produces iron on charcoal cold-blast inferior to none. This is situated directly on the line of the Iron R. R., ten miles north of Iron-ton. Here are found all the different strata of ore and coal of the Hanging Rock belt, and probably in as great profusion as at any other point. At the furnace site is found the block-ore, lying some fifteen feet above the level of the valley, and averaging ten inches in thickness, being a continuous ledge as unbroken as a vein of limestone. Sixty or seventy-five feet above this in the hills lies the limestone ore, varying in thickness from ten to thirty-six inches in localities. Right above this stratum lies an irregular vein of "kidney ore" in close juxtaposition, possessing the same general qualities but lying in lumps or "kidneys," varying in size from pieces weighing a few pounds to huge boulders of half a ton weight. Then in the tops of the hills frequently occurs another layer of kidney ore, called the "top hill ore." Both the grey and red hematite varieties of the limestone stratum are worked, producing a yield in the furnace of 40 per cent., though an exhaustive analysis would of course show a greater yield. The ore is procured by both methods of "stripping" off the surface, and by "drifting" or regularly mining for it, as in the case of coal, drifting being carried on near the furnace stack where lessened cost of transportation will balance the greater cost of mining by that method. Within a few hundred yards of the stack, drifts have been carried into the hill, as yet to no greater depth than a few yards, where, with the "kidneys" immediately overlying, the vein averages probably about thirty inches in thickness. When it is remembered that a vein of ten inches in thickness will yield about 2,800 tons per acre, it will be easy to calculate the richness of these deposits! Notwithstanding the furnace has been in successful working since 1834, a continuous period of thirty-seven years, it has been until recently only that it has been obtaining its ore by any other method than that of stripping the surface from the edges of these successive layers of ore, producing only the slightest perceptible effect on the reduction of their supply, and as compared to their actual capacity, of the most insignificant proportion. Here the hills are between two and three hundred feet high, steep and intersected by innumerable ravines, which, while cutting off the area of ore-producing surface, afford fine opportunities of arriving at the vast quantities in the hills. If we allow that there

the ore covers but one fourth of the surface, which is probably a moderate estimate, some idea is afforded of the amount of iron it is capable of producing. Assuming the ore to lie only ten inches in thickness, on the one-fourth of the Co's 9,700 acres, according to the former computation of 2,800 tons per acre, we have a sufficient supply for over 1,100 years production at the rate of eight tons of iron daily, their present rate. That this estimate is far under, instead of over the actual quantity, will be the opinion of those best acquainted with the mineral wealth of this section. Here there are two veins of coal above the limestone ore, averaging three feet in thickness each, and one lying under the block ore of from twelve to twenty-eight inches in thickness which are not worked as yet, except for the local use of the furnace people. At Vesuvius Tunnel, some three miles south in the line of the road, are situated the coal lands of the Iron-ton, Lawrence and Belfont Rolling Mills, where are produced from these two upper veins, the aggregate supplies of 2,000,000 bushels yearly for the three above mentioned manufactories alone.

This furnace was built in 1824 as a cold-blast charcoal furnace, and was afterwards changed to hot blast, before Mr. John Peters bought the property in 1869. He conceived the idea of using the native coal for smelting, which before that time had never been attempted in this section by any thing bearing the shape of actual experiment. Coal was plenty, right at the yards of the furnace. The supply of charcoal, as every one knew, must in a comparatively short time, fall short of the demand, and the interest of the iron industry demanded a fuel that should furnish a greater supply than was to be expected from that source. Mr. Peters changed the character of his furnace, put in a larger hot-blast, raised the height of the stack from thirty-eight to fifty-two feet, coal was procured from the hill immediately adjacent, and coked in the yard of the furnace, and the blast was applied in the latter part of May, 1870. There was no difficulty in making iron at the rate of twenty tons daily. But the iron lacked tenacity, it was almost white in color, seemed mixed with a great amount of cinder, and when worked in the boiling furnaces of the rolling mills, lost largely in bulk compared with other irons. Then charcoal was mixed with the coke in different proportions with improvements in the character of the iron but still failing to come up to the general standard of acceptability. Wiseacres came, looked and pondered, and went away shaking their heads, and saying, "I'm sure it wont work!" About a thousand tons were made. The iron market became depressed, the quality was still below the average of the best brands, and finally the sulphur and other impurities of the iron conquered, and the experiment ceased. The hot-blast was taken down, the furnace lowered again to the former height, the machinery arranged for cold-blast, and the charcoal pits were again smoking along the ravines on the Company's lands. There was no longer any difficulty in making iron. The old routine was once more followed, and conservatism in the iron business was satisfied. Mr. Peters is of the opinion that the stock of his furnace was only half high enough, and that had it been as high as English stacks, which are frequently one hundred and more feet in height, he should have made a success. Still his experiment is not without value. Some one will yet discover the proper method of eliminating the sulphur from the coals of this region and place millions at a stroke in the hands of furnace owners in this belt, many of whom—in fact nearly all—can dig their coal for a generation yet within a mile of their stacks.

This furnace now makes daily about eight tons of cold-blast charcoal iron which commands a special quotation in the best markets of \$55.00 per ton. It is used mostly for car wheels and kindred uses, where great strength and durability of wearing surface is required. At a test made a few months since at a car wheel factory, a three feet bar, an inch square, sustained from the center a weight of 220 lbs. more than the best brand compared with it. Two and a half tons of ore to the consumption of 200 bushels of charcoal make a ton of iron. Two hundred hands are employed and considerable ore is sent



to the two furnaces at Iron-ton from here, besides that required for the regular use of the furnace.

## HECLA FURNACE.

This celebrated furnace is located in the eastern line of the ore-belt, about three miles east from Iron-ton, hauling her iron to that wharf for shipment. It was built in 1833, and has always remained a cold-blast charcoal furnace, producing at present about eight tons daily of her iron. This has one of the highest reputations in the United States, is well known in all markets, commanding special quotations at the present of \$60.00 per ton. It is used almost exclusively for car wheels, and for that purpose probably has no superior in the world. During the war it was largely used at the Fort Pitt Foundry, in casting ordinance, and some of the heaviest artillery cast there was made from Hecla iron. The ore used is mostly the red hematite variety of the limestone stratum. Under analysis it yields about 49 per cent., but under the working of the cold blast of the furnace, about  $33\frac{1}{2}$  per cent. is extracted.

It is to this furnace to a great extent that is to be traced the high reputation "Hanging Rock Iron" has attained. For twenty years past it has made an iron which has been found to be the best in the market for a special use; and that use, the making of car wheels, the one demanding the combined qualities of the greatest tenacity, with durability of wearing surface in the highest degree. The average duration of car wheels made from ordinary irons, as found from carefully conducted experiments, is during a run of 80,000 miles. Manufacturers using Hecla iron have no hesitancy in warranting their wheels to last while running 200,000 miles. Certainly a vast difference. Hitherto the great difficulty has been to find an iron which should *combine* the two qualities before mentioned, each in the highest degree—there being no trouble particularly in securing either quality alone. Many irons would produce a wheel which would "chill" on the outside, so as to give the desired hardness and durability of wearing surface; but which, lacking the proper tenacity, and length of fibre, would shortly begin to crumble, and little by little, the particles would drop away from some weak spot and a hole be found, which would necessitate the casting away of a wheel as useless, which was not half *worn* out. This is frequently found to be the case in Salisbury iron, which has been largely used in the manufacture of car wheels. In wheels made from Hecla iron there is no such disintegration of the particles, but the wheel remains an entirety until *worn* out.

These qualities have caused it to be largely sought after, and its reputation has even extended to France, where railway companies have held correspondence with the present Company, looking toward the introduction on their lines, of car wheels made from this iron.

The ore from which this unexampled product is obtained lies in the triangular space embraced between Storms and Big Ice creeks, which empty into the Ohio river, the first at Iron-ton, the second about five miles above the first, thus giving this particular belt a river front of five miles, narrowing as it goes back to about two miles in width. Here are found the grey and red hematite varieties of the limestone ore, (as well as the block ore,) possessing some peculiar properties which impart to the iron its strength and durability. As this is on the eastern line of the ore belt under consideration, the ores lie deeper in the ground, and must generally be reached by mining, instead of "stripping." For fifteen years this has been carried on to a greater or less extent at this furnace, and in a much more extensive and scientific way than has been done elsewhere in this region. Shafts have been sunk to meet the horizontal drifts. The latter are made large enough for mules to enter, and draw the loaded cars to the entrance. Ventilation is secured by the proper arrangements of shafts and sidewalls, in order that the miner may penetrate to the fullest extent in the search after this precious mineral. Here the veins are found from 12 to 20 inches thick, and to increase,

rather than diminish in thickness, with the distance underground. There are contained in the 14,000 acres belonging to the Company enough ore to supply their furnace for indefinite generations to come, while their land will produce charcoal sufficient for its consumption. Other furnaces through this section have attempted the speciality for which Hecla is famous, but although cold-blast charcoal iron is produced, the peculiarly distinguishing qualities of Hecla iron are not obtained, though it must not be understood that it cannot be, or that Hecla alone is capable of supplying this article. The same varieties of ore lie to a considerable extent through the entire region spoken of, and by the same close and scientific attention which Hecla has given to their smelting, similar qualities may be attained by a number of other furnaces in this vicinity.

## VESUVIUS.

This furnace now operated by Messrs. Gray, Amos & Co., is located on Storm's Creek, some eight miles north from Ironton, and two and a half miles from the Iron R. R., by which it ships its iron.

It has been in successful operation since 1833, and is now blowing a "warm-blast," using air at a lower temperature than "hot-blast," producing an average daily yield of ten tons of iron with charcoal fuel. This iron is especially adapted for use in car wheels, and for chilled rolls, and has consequently attained a very high reputation and a high price, far above the average of American iron, selling in the markets of Cincinnati, St. Louis, Louisville and Pittsburg at an average price of \$48.00 per ton. There are about 4,500 acres of land belonging to the furnace, rich in ores—particularly the limestone ores and the red hematite variety, which is principally used in the furnace. The land is well cut by ravines and well watered, (an item of great importance in the burning of charcoal and working of furnaces,) the water having sulphur, limestone and freestone characteristics. The ore lies in four or five different strata, the coal in veins of 36 and 40 inches in thickness and easily mined, extending over 500 or 600 acres, and inexhaustable quantities of molding sand, lime and sandstone. The amount of ore used to the ton of iron is on an average of two and three-fourth tons, together with 190 bushels of charcoal and two hundred pounds of limestone. One hundred and twenty hands are employed, at an average price of \$1.60 per day. In 1870 the furnace made 2,500 tons of iron. The managers are men of liberal enterprise and intelligence in their business, and deserve the success they have won.

## MT. VERNON FURNACE.

This is a hot-blast charcoal furnace, built in 1854, by R. Hamilton & Co., and now owned and operated by Messrs. Hiram Campbell & Sons. The furnace produces an average yield of thirteen tons daily, of an excellent forge and foundry iron, commanding the highest market prices for those purposes at Ironton, Cincinnati and Louisville. There are 11,000 acres belonging to the furnace, underlaid with at least two strata of ores, averaging in thickness from eight to ten inches each, yielding in the furnace about 43 per cent. of iron with a consumption of 140 bushels of charcoal to the ton produced. Limestone, fire-clay, building-stone, stone for furnace hearths and molding-sand exist on this tract in greater or less quantities, but mostly undeveloped for any except the immediate local wants of the furnace, and to so small an extent that there are no means of arriving at any comparative statement of their abundance.

Coal also is found in great abundance, of an excellent burning quality for general use, but has never been tested for its smelting properties.



## HOWARD FURNACE.

This is situated some four miles from the Iron R. R., and seventeen north from Ironton, in Scioto Co., though shipping iron and transporting supplies on the Iron R. R., and to and from the former place. It was built in 1853 by Messrs. Campbell, Woodrow & Co., and is now owned and managed by the Charcoal Iron Company, President, S. C. Johnson, and with headquarters in Ironton. Belonging to this furnace are 7,300 acres, with several strata of ore, of what are known as the top-hill, the limestone, running from eight inches to as high as seven feet in thickness in a few locations, and three veins of black ore. The furnace being really on the western line of the ore-belt, there are often more strata than happen to occur going eastward, the cause being as heretofore stated that on the western line all the strata come to the surface, disappearing below it as they go eastward. Coal and limestone abound, but lack development except for local uses. This yields an average of thirteen tons daily, (in 1870, 3,016 ton were produced,) mostly "No. 1 Foundry" and shipped largely to Pittsburg, Wheeling, Cincinnati, Louisville and Evansville, being principally cast into stoves and stove plates. The same Charcoal Iron Company own and operate the

## BUCKHORN FURNACE,

a hot blast charcoal furnace, situated near Howard, on the western line of the ore belt, and shipping by the Iron R. R., producing an average daily yield of twelve tons of mill and foundry iron, with an aggregate of 2,810 tons during the year 1870. Here in practice the ores yield 40 per cent. of iron, with the consumption of 170 bushels of charcoal per ton, the limestone ores being mostly used. Seventy-five hundred acres of land belong to this furnace, rich in ores, limestone, coal, and sandstone.

The village of

## HANGING ROCK,

from which this entire region derives its name, lies on the Ohio bank of the river, three miles below Ironton. The name was given it from the over-hanging cliff above the town, where the bold front of a huge rock juts from the hill, threatening the village below, literally, with a "Hanging Rock." The town is located between the hill and the river, possessing only a narrow foothold in most places and extending along the base of the hill some distance as best it may. It was settled shortly after the year 1830, and till the opening of the Iron R. R., to Ironton, formed the principal shipping port for the furnaces of the Ohio side, gave their products its name, and through them named this entire iron belt. For a while it seemed on the highway to greatness, but the founding of Ironton in a much more advantageous locality, was fatal to those expectations. It now numbers about 800 inhabitants, and contains two foundries, and is the headquarters of Messrs.

## MEANS, KYLE & CO.,

who own and operate Pine Grove and Ohio Furnaces, and the Hanging Rock Coal Works. Both of these furnaces are hot-blast charcoal furnaces, yielding respectively from 15 to 18 tons, and 17 and 18 tons daily of "No. 1 Foundry" iron, and shipped principally to Cincinnati, Pittsburg, and Louisville. These have been in operation, Pine Grove since 1829, and Ohio since 1845, and are among the very best producing and well managed furnace properties

of this region. This firm employs one hundred miners in their coal works, and runs a railroad from the river at Hanging Rock, to their coal works and to Pine Grove furnace, three and one-third miles in length, over which they transported last year 1,000,000 bushels of coal, and 3,000 tons of iron to their wharf in Hanging Rock. This coal is of excellent quality and largely used by the boats on the river, and for shipments to Cincinnati, and the production of it may be largely increased.

Here is also the foundry of Messrs. **MARTIN, HENDERSON & Co.**, producing stoves, fronts and grates, and marbleized iron mantals. The works were erected in 1845 by Messrs. Peebles, Wood & Co., and employ a capital of \$18,000, producing yearly, manufactured wares of the value of \$40,000, employing about thirty workmen, and selling their goods in Ohio, Indiana, Kentucky and Virginia.

## THE EXCELSIOR FOUNDRY

of S. B. Hempstead & Co, was erected in 1870, and has already built up a large and increasing trade. This foundry makes several new and popular styles of wood and coal stoves, all kinds of hollow ware, grates and general castings, using Pine Grove and Ohio furnace irons. They are thoroughly and newly appointed throughout, and are quite an addition to the business, not only of the village of Hanging Rock, but of the surrounding region also.

## ASHLAND.

The town of Ashland is on the Kentucky shore of the Ohio river, about four miles above Iron-ton, and occupies a beautiful site, with abundance of room for the expansion into the large manufacturing town it is destined to be. It was laid out in 1854, by the "Kentucky Iron, Coal and Manufacturing Co.," and from its situation is the center of a vast business in the Kentucky subdivision of the Hanging Rock region. The Lexington & Big Sandy R. R. Co., Eastern Division, runs from this point to Rush Station, 17 miles back from the river and brings to the river and to Ashland all the coal from the Coalton banks, which supplies the Ashland and Belfont furnaces, the rolling mills in Portsmouth, and the vast amount they ship to Cincinnati and elsewhere, the iron from Star, Mount Savage, and Buena Vista furnaces, and the produce from a large scope of country, and conveys back in return great quantities of goods for the country in its vicinity, in which there are ten stores, in a radius of twenty miles from Ashland, whose sales run from \$40,000 to \$150,000 each yearly. The trade of the place requires a bank with a capital of \$300,000, which will indicate to some extent the amount of business done in its neighborhood. The town numbers now about 2,000 inhabitants, has in its boundaries the large Ashland furnace, producing it's thousand tons of iron monthly, the R. R. machine shops, large flouring mill, planing and saw mill, where several boats and barges have been built, besides the usual complement of stores and minor establishments to be found in such towns. The harbor of Ashland is one of the best along the entire course of the Ohio river, for three miles along the front of the town averaging 20 feet in depth the year round, and furnishing the best location for dry docks, now unoccupied between Cincinnati and Pittsburg. In the building of iron hulls for steamboats, no better locality can be found. Timber is here easily and cheaply procured from the immediate neighborhood, and from the Big Sandy and Guyandotte rivers, immediately above here.



Ashland is the terminus, and the headquarters, of

## THE LEXINGTON AND BIG SANDY R. R. CO., EAST-ERN DIVISION.

This company is the wealthiest corporation in the Ashland section, and employs a large capital, and a great number of hands in developing the resources of Ashland and vicinity. It was incorporated in 1854, with a capital stock of \$1,440,000, and now owns and operates the railroad running back seventeen miles to Rush Station, though the road has been designed to run to Lexington, and without doubt will soon be pushed out further into the interior, more especially should the Chesapeake & Ohio R. R. make their proposed road from Huntington, through the rich mineral region in the interior, to the right of Lexington, where mineral riches incalculable await only an opportunity for development. At present the road transport the iron from Mt. Savage, Star, and Buena Vista furnaces besides the native ore used in the Ashland furnace, and whatever there may be for exportation. During the year 1870 the road carried 6,000 tons of ore, 1,325 tons of limestone, 125,000 tons of coal, and 14,558 passengers.

In their

### COAL WORKS DEPARTMENT,

they own 9,000 acres of land, exceedingly rich in ores of the finest quality, besides vast deposits of coal known as the "Ashland coal," which is the only vein of supplying coal for smelting purposes in this immediate section. It is used in the Ashland furnace, the Belfont of Iron-ton, and is supplied to the rolling mills of Portsmouth and Cincinnati, and large quantities are used by the boats of the Ohio river passing Ashland, and again large shipments are made to the Cincinnati market for ordinary domestic use. For smelting in the raw state, and for a grate coal there is no superior. The following is the analysis as furnished by the company. Specific gravity 1.282; coke 57.40; sulphur 0.19; ashes 1.88; carbon 84.08; hydrogen 4.92; oxygen 9.12.

The coal works of the company are situated at Coalton, some thirteen miles back from the river on the waters of William's creek. Here the Company employ three hundred and fifty hands in mining, who deliver annually into the cars of the Company some 3,000,000 bushels, and receiving for their labor the aggregate sum of \$200,000 therefor. The supplies necessary for the consumption of this body of laborers, and the wants of the company, are drawn principally from Pittsburg, Cincinnati, and Portsmouth. It is gratifying to know that the trade of the company is rapidly increasing. From Coalton, coal fully equal to the best Pittsburg article, can be mined at equal cost, and shipped from the best harbor between that city and Cincinnati, at times when Pittsburg is quite inaccessible. At the present writing only the smallest of even light draught boats can pass above the mouth of the Big Sandy at Catlettsburg, five miles above Ashland, and though this is a season of unexceptionally low water, Ashland furnishes a harbor deep enough for the very largest boats on the Ohio, with ample accommodations for fleets of coal boats. The vein from which their coal is procured, underlies a great portion of the country, and is about four feet in thickness, at Coalton lying some sixty feet above the bed of the railroad. Forty feet above this vein lies another seam from four and a half, to six feet in thickness, also of first class quality. The immense quantity of coal contained in the immediate neighborhood, its excellent qualities, and the ease and cheapness with which it may be mined, leads to a feeling of surprise that there are not more com-



panies engaged in developing the coal trade from Ashland to Cincinnati, especially when it is considered that it is situated at less than one-third of the distance from Cincinnati to Pittsburgh.

### ASHLAND FURNACE.

This immense furnace was built in 1869, by the Lexington & Big Sandy R. R., Eastern Division, and at the time of its erection was said to have the largest stack west of the Alleghany mountains being capable of producing an average of forty tons daily, or about one thousand tons per month. To the honor of the managers be it said, their huge stack sets a landable example to the rest of the region, by 'keeping Sunday,' completely disproving by the results, the oft repeated assertions of iron-masters, that it was impossible to run a blast furnace successfully, when stopping one day in seven. This furnace uses stone coal from the celebrated Ashland vein at Coalton, on the lands of the railroad company, using from 100 to 120 tons of it daily, together with from 60 to 75 tons of ore, two-thirds of which is Missouri ore, brought to the furnace landing in boats, the balance native ore, from the lands of the Company, near Coalton, fluxed by from 15 to 20 tons of native limestone, producing a good quality of mill iron which is sold at the wharf of the furnace, for a present market price of \$31 and \$32 per ton, and sent mostly to the Iron-ton Rolling Mills, to Cincinnati and New Albany, for railroad iron and ordinary mill purposes. The success of this furnace has led the Company to consider the propriety of building additional furnaces, which will probably soon be done, more especially, since the proposed building of the Kentucky and Great Eastern R. R., which will, if completed, pass directly through Ashland.

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*Secretary Board of Trade,*

*IRONTON, Ohio.*

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C. B. Egerton, cor. Second and R. R. streets.

J. Shaw, cor. Second and Center streets.

Mather & Wilson, Second National Bank.

### **Attorneys.**

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Wm. Forgey, Enterprise Block, Second street.

W. S. McCune, cor. Railroad and Second streets.

Ezra V. Dean, Center Block, Second street.

John S. George, cor. Railroad and Second streets.

W. H. Enochs, Roger's Block, cor. Railroad and Second streets

B. H. Garvey, Center Block, cor. Center and Second streets,

John Hamilton, Enterprise Block, Second street.

J. L. Anderson, Center street, near Second street.

**Attorneys—Continued.**

O. S. Collier, Center Block, Second street.  
Neal & Cherrington, Enterprise Block, cor. Center and Second street.  
A. B. Cole, Enterprise Block, Second street.  
Elias Nigh, Center, near Second street.  
Albert Lawson, Second street, Center street.

**Banks.**

First National Bank, cor. Second and Railroad streets.  
Second National Bank, Roger's Block, cor. Second and Railroad streets.  
Wm. D. Kelly, Second street, near Railroad.

**Book-Binding.**

Dunne & Dempsey, No. 10 E. Second street, Dempsey's Block.

**Books and Stationery.**

Dunne & Dempsey, No. 10 E. Second street, Dempsey's Block.  
J. & M. Davidson, No. 5 Roger's Block, Second street.

**Boots and Shoes.**

Thos. McCarthy, No. 6 Union Block, Second street  
R. & H. Goff, cor. Fourth and Railroad streets  
John Simon, No. 9 Enterprise Block, Second street.

**Builder.**

Wm. E. R. Kemp, Vernon, between Third and Fourth street.

**Boiler Makers.**

Hastings & Crierher, Front street, near Buckhorn

**Clothing.**

B. F. Ellsberry, Second, between Lawrence and Buckhorn.  
Geo. Newberger, No. 5 Union Block, Second street.  
Henry Dettmar, No. 11 Enterprise Block, Second street.  
Kaufman & Co., Center Block, Second street.

**Confectioners.**

Wm. Gonder, cor. Third and Center streets.  
Jas. Levering, cor. Second and Buckhorn streets.  
Jacob Ensinger, cor. Second and Olive streets.  
J. Matthews & Bro., Second, between Lawrence and Buckhorn streets.

**Druggists.**

Ball and Winters, cor. Second and Railroad.  
Bartram & Peters, cor. Second and Center streets.

**Dry Goods.**

Jas. Small, Center Block, Second street.  
J. T. Davis, cor. Second and Lawrence streets.  
H. Clark, No. 4 East Second street.



**Dry Goods—Continued.**

D. W. Richards, No. 7 Union Block, Second street.  
 Mrs. E. Ward & Co., Center Block, Second street.  
 S. Ward & Son, Center Block, Second street.  
 Gilfillan & Mayberry, Roger's Block, Second street.

**Furnaces, (P. O. Ironton.)**

BELFONT—Belfont Iron Works Co.  
 GRANT—Wm. D. Kelly & Sons.  
 CENTER—Wm. D. Kelly & Sons.  
 HECLA—Hecla Iron and Mining Co.  
 MONITOR—Monitor Furnace Co.  
 VESUVIUS—Gray, Amos & Co.  
 ÆTNA—Ellison, Dempsey & Ellison.  
 LAWRENCE—Lawrence Furnace Co.  
 MT. VERNON—H. Campbell.  
 OLIVE—Campbell, McGugin & Co.  
 BUCKHORN—Charcoal Iron Co.  
 HOWARD—Charcoal Iron Co.

**Forwarding and Commission Merchants.**

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 M. A. McLaughlin, Upper Wharf-boat.

**Furniture.**

D. Nixon, cor. Third and Railroad.  
 P. Herbert, No. 8 East Second street.

**Groceries—Wholesale.**

Dempsey, McQuigg & Dempsey, No. 12 East Second street.  
 Clark & Clarke, No. 7, Commercial Block, Second street.  
 D. S. Murdock & Son, cor. Second and Lawrence streets.  
 D. T. Davis, cor. Second and Lawrence streets.  
 E. Ferguson, cor. Second and Olive streets.

**Groceries—Retail.**

D. T. Miles, cor. Lawrence and Second streets.  
 D. T. Davis, cor. Second and Lawrence streets.  
 E. Ferguson, cor. Second and Olive streets.  
 Winters & Bro., cor. Third and R. R.  
 Jas. Levering, cor. Second and Buckhorn streets.  
 John Matthews & Bro., Second between Lawrence & Buckhorn streets.  
 I. B. Murdock, Second street, West of Ironton.

**Hardware, Etc.**

John A. Witman & Co., Second street, below R. R.  
 T. N. Davey, cor. Center and Second street.

**Harness and Saddlery.**

W. & J. Nixon, cor. Third and R. R.  
 V. Boll & Co., cor. Second and Center streets.

**Hats and Caps.**

D. W. Richards, No. 7, Union Block, Second street.  
Joseph Lloyds, Second near Buckhorn streets.  
Kaufman & Co., Center Block, near Center street.  
B. F. Ellsberry, Second near Lawrence street.  
R. & H. Goff, cor R. R. and Fourth street.

**Hotels.**

Sheridan House, cor. R. R. and Front street.  
Ironton House, Front street near Landing.

**Lumber Merchants.**

M. Wise & Co., Front street.  
Newman & Co., Front street, foot of Jefferson street.

**Machine Works.**

Lambert & Gordon, cor. Second and Hecla streets.

**Millinery and Fancy Goods.**

Mrs. J. M. Brown, cor. R. R. and Fourth street.  
Mrs. E. Wheatcraft, Center near Third street.

**Nail Mills.**

Belfont Iron Works, cor. Second and Etna streets.

**Newspapers.**

Ironton Journal, cor. R. R. and Second street.  
Ironton Register, Roger's Block, Second street.

**Photographer.**

Colville & Peters, Enterprise Block, Second street.  
L. L. Hitt, Third near R. R.

**Printing.**

L. P. Ort, Plain and Ornamental Printing, Ironton, O.  
Journal Office, R. R. and Second street.  
Register Office, Roger's Block, Second street.

**Queensware.**

Wm. Gruneberg, Second street, near Lawrence.

**Rolling Mills.**

Ironton R. M. Co., Front street, foot of Second street.  
Lawrence Iron Works, Second and Vesuvius street.

**Stoves, Tin Ware, Etc.**

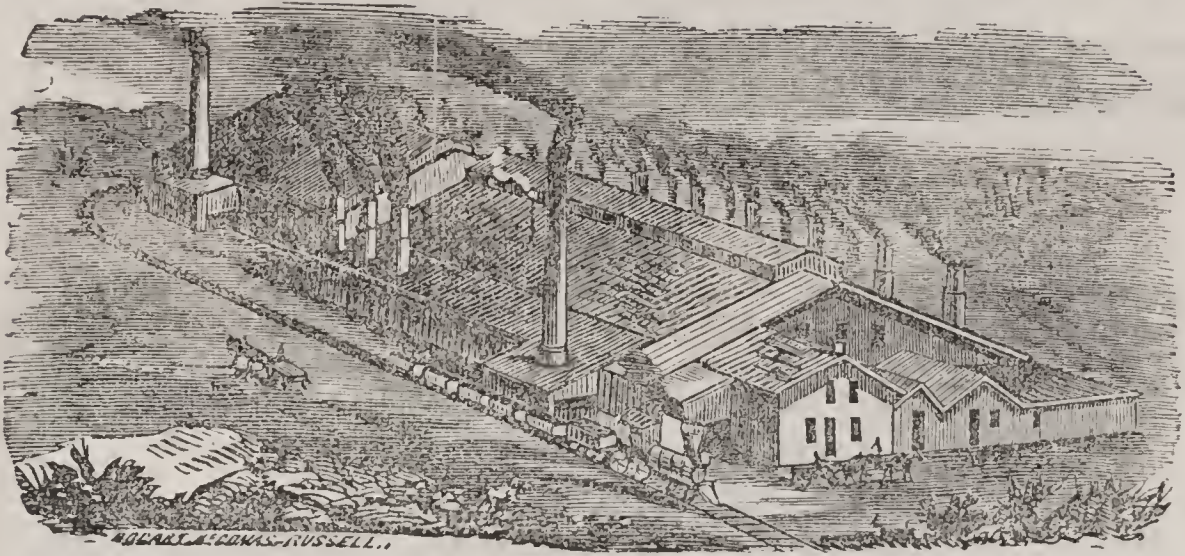
R. B. Hamilton & Co., R. R. near Third street.  
J. C. McGugin, Second near Lawrence street.  
J. A. Witman, Second near R. R.

**Watchmakers and Jewelers.**

Geo. Lampman, Second near R. R.  
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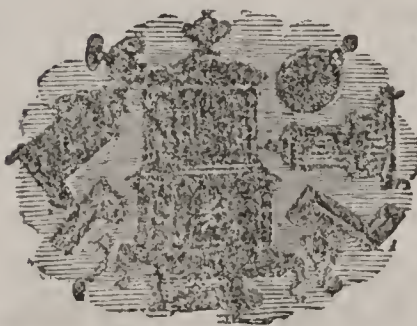
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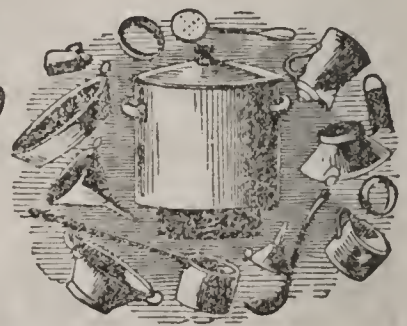


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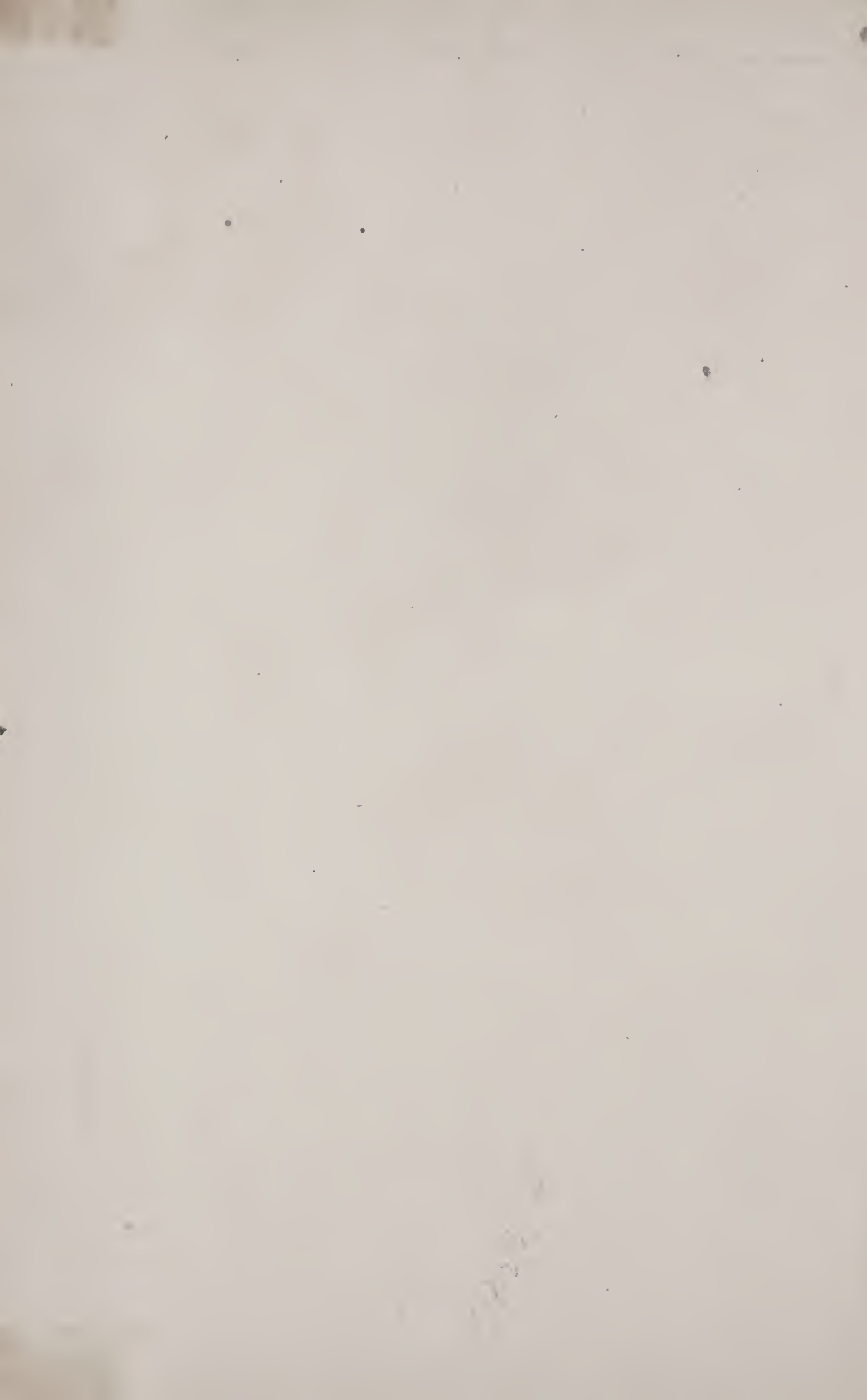




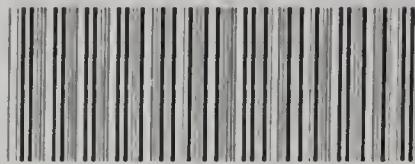








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